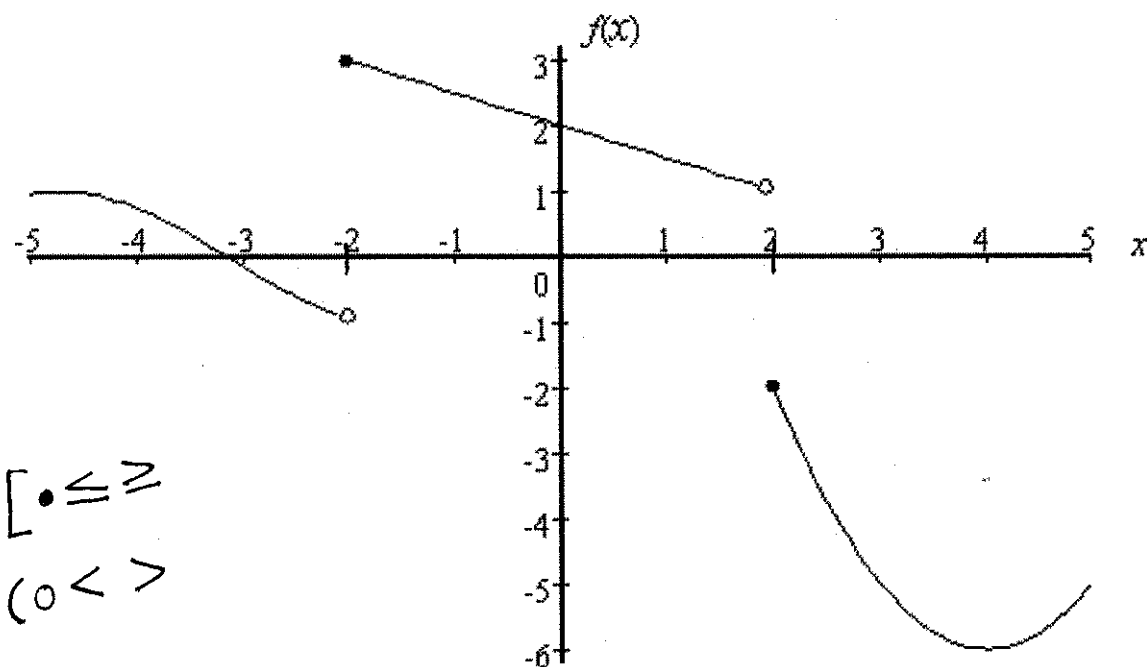


**Pre Calculus Honors**  
**2014 Final Exam Review #2**

**Name:** KEY  
**Date:**



$[\bullet \leq \geq]$   
 $(\circ < >)$

1. What is the domain of the graph? $(-\infty, +\infty)$	2. What is the range of the graph? $[3, -6]$
3. Identify the intervals on which the graph is decreasing linearly. $[-2, 2)$	4. What defines a function? How can you tell from the graph? Each $x$ -value has only one $y$ -value vertical line test
5. Find the value of:  $f(-2) = 3$  $f(0) = 2$  $f(2) = -2$  $f(4) = -6$	6. Find all values for $x$ where:  $f(x) = 0 \quad x = -3.2$  $f(x) = -1 \quad x = \text{DNE (open circle!)}$  $f(x) = -5 \quad x = 3 \quad \& \quad x = 5$
7. On what intervals is $f(x) < 0$ ? Estimate where needed. $(-3.2, -2] \cup [2, +\infty)$	8. On what interval is the function decreasing linearly?  see # 3

Given the following functions, find two function  $f(x)$  and  $g(x)$  so that  $h(x) = f(g(x))$ .

9.  $h(x) = 2\cos^2 x + 4\cos x + 5$

$f(x) = 2x^2 + 4x + 5$

$g(x) = \cos x$

10.  $f(x) = e^{2x} + 5e^x - 7$

$f(x) = x^2 + 5x - 7$

$g(x) = e^x$

### Inverses & Composition

11. Find the inverse  $f^{-1}(x)$  of the following function:

$$f(x) = \frac{4x+3}{2x-6}$$

$$(2y-6)x = \frac{4y+3}{2y-6} (2y-6)$$

$$2yx - 6x = 4y + 3$$

$$-6x - 3 = 4y - 2yx$$

$$-6x - 3 = y(4 - 2x)$$

$$\frac{-6x-3}{4-2x} = y = f^{-1}(x)$$

12. Show by function composition that the functions  $f(x)$  and  $g(x)$  are inverses.

$$f(x) = \frac{5}{x+7}$$

$$g(x) = \frac{5}{x} - 7$$

$$f(g(x)) = \frac{5}{\left(\frac{5}{x} - 7\right) + 7}$$

$$= \frac{5}{\frac{5}{x}} = 5 \cdot \frac{x}{5} = x$$

yes, inverses

13. Find the derivative of the following function using the definition of derivative.

a.  $f(x) = 5x^2 + 3x - 6$

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{5(x+h)^2 + 3(x+h) - 6 - (5x^2 + 3x - 6)}{h}$$



$$f'(x) = 10x + 3$$

b. What does the derivative tell you?

The slope of the tangent line!

c. What is the equation for the tangent line at  $x = 7$ ?

The slope is  $f'(7) = 73$  The coordinate pt is  $(7, 260)$

derivative

$$y - 260 = 73(x - 7)$$

$$y - y_1 = m(x - x_1)$$

**Find the x-intercepts by factoring.**

<p>14. <math>f(x) = x^2 - x - 56</math></p> $f(x) = (x-8)(x+7)$ $x = 8 \quad \& \quad x = -7$	<p>15. <math>f(x) = 18x^2 + 9x + 1</math></p> $f(x) = 18x^2 + 6x + 3x + 1$ $= 6x(3x+1) + 1(3x+1)$ $= (3x+1)(6x+1)$ $x = -\frac{1}{3} \quad x = -\frac{1}{6}$	<p>16. <math>f(x) = 4900 - 36x^2</math></p> $f(x) = (70+6x)(70-6x)$ $\cancel{70}x = -\frac{70}{6} \quad x = \frac{70}{6}$
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17. If  $x = 2$  is an x-intercept of  $p(x) = x^3 + 2x^2 - 5x - 6$ , find the other two zeros AND write the factored form of the polynomial. Use division.

see sign.  
Factor is  
(x-2)

$$\begin{array}{r|rrrr} 2 & 1 & +2 & -5 & -6 \\ & & 2 & 8 & 6 \\ \hline & 1 & 4 & 3 & 0 \end{array}$$

$x^2 + 4x + 3$

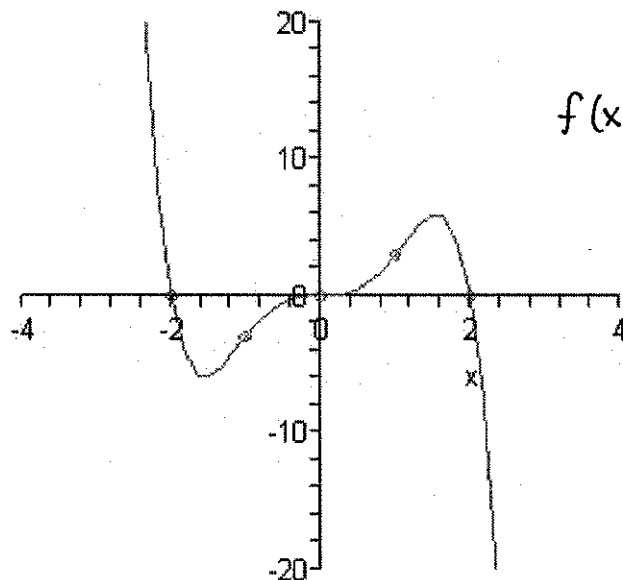
Remainder

$$f(x) = (x-2)(x^2 + 4x + 3)$$

$$f(x) = (x-2)(x+1)(x+3)$$

Fully factored!

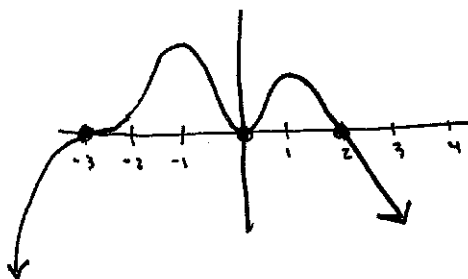
18. Write a factored form equation for the following function below.



$$f(x) = -1x^3(x+2)(x-2)$$

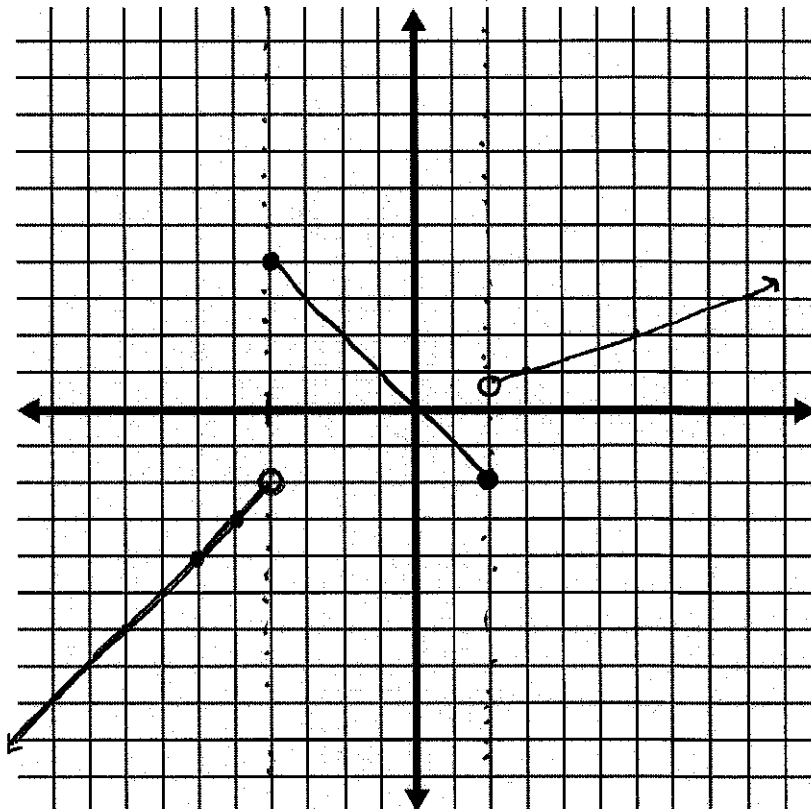
negative because  
of the end  
behavior!

19. Sketch a graph of  $f(x) = -4(x+3)^3(x)^2(x-2)$

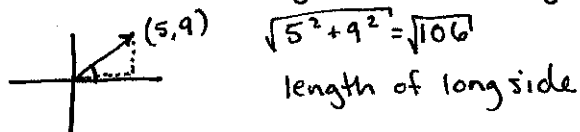


20. Graph the following piecewise function

$$f(x) = \begin{cases} 2+x & \text{if } x < -4 \\ -x & \text{if } -4 \leq x \leq 2 \\ \frac{1}{3}x & \text{if } x > 2 \end{cases}$$



21. Find the six trig functions of an angle if the terminal side passes through (5, 9).



$$\sin A = \frac{9}{\sqrt{106}}$$

$$\csc A = \frac{\sqrt{106}}{9}$$

$$\cos A = \frac{5}{\sqrt{106}}$$

$$\sec A = \frac{\sqrt{106}}{5}$$

Solve the following rational equations.

$$\tan A = \frac{9}{5}$$

$$\cot A = \frac{5}{9}$$

22.  $\frac{x}{15} + \frac{1}{3x} = \frac{2}{5}$

Multiply through by 5.

$$\frac{x}{3} + \frac{5}{3x} = 2$$

Multiply by 3

$$x + \frac{5}{x} = 6$$

Multiply by x

$$x^2 + 5 = 6x$$

$$x = 5$$

$$x = 1$$

23.  $\frac{2}{x-2} + \frac{2}{5} = \frac{3x}{5x-10}$

$$\frac{2}{x-2} \cdot \frac{5(x-2)}{5(x-2)} + \frac{2}{5} \cdot \frac{5(x-2)}{5(x-2)} = \frac{3x}{5(x-2)} \cdot \frac{5(x-2)}{5(x-2)}$$

$$10 + 2(x-2) = 3x$$

$$10 + 2x - 4 = 3x$$

$$6 = x$$